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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/693,156

10/24/2003

Arch D. Robison

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08/10/2006

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EXAMINER

KISS, ERIC B

ART UNIT

PAPER NUMBER

2192

DATE MAILED: 08/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/693,156

Applicant(s)

ROBISON, ARCH D.

Examiner

Eric B. Kiss

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 October 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 10-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 10-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>20031024, 20050714</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 10-21 have been examined.

Specification

2. The use of trademarks, such as JAVA, has been noted in this application. Trademarks should be capitalized wherever they appear (capitalize each letter or accompany each trademark with an appropriate designation symbol, *e.g.*, TM or ®) and be accompanied by the generic terminology (use trademarks as adjectives modifying a descriptive noun—for example, “the JAVA programming language”).

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

Claim Objections

3. Claim 21 is objected to because of the following informalities: “tress” in line 6 should apparently read --trees--. Appropriate correction is required.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. Claims 10-21 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

A claim that requires one or more acts to be performed defines a process. However, not all processes are statutory under 35 U.S.C. § 101. To be statutory, a claimed process must either: (A) result in a physical transformation for which a practical application is either disclosed in the specification or would have been known to a skilled artisan, or (B) be limited to a practical application which produces a useful, tangible, and concrete result. *See Diamond v. Diehr*, 450 U.S. 175, 183-84, 209 USPQ 1, 9 (1981) (quoting *Cochrane v. Deener*, 94 U.S. 780, 787-88 (1876)) (“A [statutory] process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing The process requires that certain things should be done with certain substances, and in a certain order; but the tools to be used in doing this may be of secondary consequence.”). *See also In re Alappat*, 33 F.3d 1526, 1543, 31 USPQ2d 1545, 1556-57 (quoting *Diehr*, 450 U.S. at 192, [209 USPQ at 10]).

In *State Street*, the Federal Circuit examined some of its prior section 101 cases, observing that the claimed inventions in those cases were each for a “practical application of an abstract idea” because the elements of the invention operated to produce a “useful, concrete and tangible result.” *State St. Bank & Trust v. Signature Fin. Group*, 149 F.3d 1368, 1373-74, 47 USPQ2d 1596, 1601-02 (Fed Cir. 1998). For example, the court in *State Street* noted that the claimed invention in *Alappat* “constituted a practical application of an abstract idea (a mathematical algorithm, formula, or calculation), because it produced ‘a useful, concrete and tangible result’—the smooth waveform.” *Id.* Similarly, the claimed invention in *Arrhythmia* “constituted a practical application of an abstract idea (a mathematical algorithm, formula, or calculation), because it corresponded to a useful, concrete and tangible thing—the condition of a

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patient's heart.” *Id.* (citing *Arrhythmia Research Tech. V. Corazonix Corp.*, 958 F.2d 1053, 22 USPQ2d 1033 (Fed. Cir. 1992)).

In determining whether the claim is for a “practical application,” the focus is not on whether the steps taken to achieve a particular result are useful, tangible and concrete, but rather that the final result is “useful, tangible and concrete.” The Federal Circuit further ruled that it is of little relevance whether a claim is directed to a machine or process for the purpose of a § 101 analysis. *AT&T Corp. v. Excel Commc'ns*, 172 F.3d 1352, 1358, 50 USPQ2d 1447, 1451 (Fed. Cir. 1999).

Claims 10-21 require a determination of whether a branch in a control-flow graph is “rarely taken.” *See* Claim 10 at lines 2-3 and Claim 21 at lines 12-13. The specification fails to provide a description of how such determination may be done, other than indicating a general presumption that exceptions rarely occur. (*See, e.g.*, Specification at p. 5, lines 13-15.) Without a description of how one attempting to practice the recited methods may reasonably determine how to qualify a control-flow branch as rarely taken, the prescribed methods do not provide for assured, repeatable results, and cannot be said to be concrete. Further, the “result” of claims 10-21 appears to be a series of calculations, or at best, the insertion of instructions into an abstraction of a computer program (see, for example, claim 19, lines 1-2, and claim 21, lines 21-22). The claims do not suggest as a result of practicing the claimed methods that any real-world change would occur in an existing computer program capable of being installed, executed, or otherwise conveyed in a manner supporting a practical application as a tangible result that would enable any intended usefulness to be realized.

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6. To expedite a complete examination of the instant application, the claims rejected under 35 U.S.C. §101 (non-statutory) above are further rejected as set forth below in anticipation of Applicant amending these claims to place them within the four statutory categories of invention.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 10-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "rarely taken" in claims 10 and 21 is a relative term which renders the claims indefinite. The term "rarely taken" is not defined by the claims, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The limitations regarding calculating down-safety are unclear in view of the inclusion of this relative term.

The insertion of a "prologue," as recited by claims 13, 20, and 21 is unclear in view of the specification describing such a prologue as, "zero or more instructions that perform some housekeeping." (Specification at p. 11, lines 20-21 (emphasis added).) It is unclear whether this step requires any action or necessarily further limits the claims, and accordingly, this step further renders claims 13, 20, and 21 indefinite.

Claim 20 recites the limitation "the routine" in line 3. There is insufficient antecedent basis for this limitation in the claim.

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Claim 21 recites the following limitations that lack sufficient antecedent basis in the claim: “the program” in line 2; “said program” in line 4; “the stack” in lines 4, 7, 10, 13, 15, 17, and 22; “the stack state” in line 6; “the tree” in lines 7 and 9; “the existing pointer” in lines 25-26; and “the EH stack” in line 26.

Claims 17 and 18 each recite, “executing flow equations”. Because equations are not generally considered executable elements in and of themselves, it is unclear what is meant by this limitation in the claims, and accordingly, these claims are indefinite.

Claims 10-20 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. Claims 10-20 do not appear to clearly set forth the steps necessary to achieve the elimination of partial redundancy as set forth in the preamble of claim 10.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 10 is rejected under 35 U.S.C. 102(b) as being anticipated by Rastislav Bodík, et al., "Complete Removal of Redundant Expressions," In Proceedings of the ACM SIGPLAN '98 Conference on Programming Language Design and Implementation, pages 1-14, June 1998 (hereinafter “Bod1998”).

As per claim 10, Bod1998 discloses:

speculatively computing down-safety (anticipability) by ignoring rarely taken branches in a control-flow graph (see, e.g, section 2, on pp. 3-5, describing the calculation of anticipability and availability; section 3.3 on p. 8, describing disregarding of infrequent paths in computing the benefit of duplicating a region for *Must-Must* paths (Must-available entry edge and Must-anticipated exit edge); in the interest of compact prosecution in view of the rejection of claim 10 under 35 U.S.C. § 112, second paragraph (above), "rarely taken" is here interpreted to mean the same thing as the infrequent paths, determined by path profiles, disclosed by Bod1998 on p. 8);

computing up-safety (availability) using the results of the down-safety calculation to determine where operations are speculatively available (see, e.g, section 2, on pp. 3-5, describing the calculation of anticipability and availability).

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following documents generally describe partial-redundancy elimination and the computation of down-safety and up-safety in the context of partial-redundancy elimination:

- Rajiv Gupta, "Code Optimization as a Side Effect of Instruction Scheduling," Intl. Conf. on High Perf. Computing, pages 370-377, Bangalore, India, Dec. 1997.
- Rajiv Gupta, et al., "Resource-Sensitive Profile-Directed Data Flow Analysis for Code Optimization," 30th IEEE/ACM Intl. Symp. on Microarchitecture, pages 358-368, Research Triangle Park, NC, Dec. 1997.
- Antony L. Hosking, et al., "Partial Redundancy Elimination for Access Path Expressions," In Proceedings of the International Workshop on Aliasing in ObjectOriented Systems (Lisbon, Portugal), 1999, pp. 1-12.

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- U.S. Patent No. 6,044,221 (Gupta et al.).

12. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Eric B. Kiss whose telephone number is (571) 272-3699. The Examiner can normally be reached on Tue. - Fri., 7:00 am - 4:30 pm. The Examiner can also be reached on alternate Mondays.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Tuan Dam, can be reached on (571) 272-3695. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Any inquiry of a general nature should be directed to the TC 2100 Group receptionist: 571-272-2100.



Eric B. Kiss
August 7, 2006